E-Business in Bulgaria

E-BUSINESS IN BULGARIA

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Abstract. This paper presents the findings of a survey of e-business in Bulgaria. The survey was done which was conducted for the International Council for Research and Innovation in Building and Construction (CIB). CIB Task Group TG83 was founded in 2011 to investigate and promote the area of E-Business in construction. The survey was conducted in a variety of countries such as the United Kingdom, Canada, Ghana, Australia, and Sri Lanka. The commission was extended to include Bulgaria. An on-line standard survey was used in each of the countries listed. A survey of Bulgarian Construction Chamber Companies produced 55 full responses to the survey. The findings show that Bulgaria uses e-business less than the United Kingdom. This means, however, that by adopting e-business Bulgarian companies have more potential to achieve efficiencies as a result of its adoption. The paper identifies ways in which Bulgarian companies can achieve more efficient workflows and put into place strategies for embedment. Additional use of facilities management, estimating and sub-contracting software and cloud based systems has the potential to improve Bulgarian construction organisations efficiency and produce cost, time and quality savings.

Keywords: CIB, Electronic Business in construction, TG83, Bulgaria.

1. INTRODUCTION

E-business was first defined by Building Information Modelling (IBM) [1] as a way of transforming key business processes by using the internet. This has been widened by Li [2] to include all exploitation of Information Communication Technology (ICT), as a means of creating effectiveness and efficiency

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through innovation and technology. This paper seeks to focus on the Construction industry functions in this regard. Substantial progress has been made through innovation to transform physical processes into electronic forms. These e-business generated workflows have used ICT innovations and adoption to produce a leaner work flow [3, 4]. In addition, communication through 3D models and associated common data environments is seen as one of the greatest drivers for BIM [5]. Fulford and Standing [6] consider e-business as the mainstay of efficiency improvements as it allows automation and integration of all of the components. ICT, therefore, can be used for the benefit of all aspects of construction administration, including the design process, specifications, estimating, cost planning/cost control, tender documentation and process, project programming, valuations and the final account, project monitoring, and communication. Bédard, [7] concluded that "Undoubtedly, professionals in the AEC Industry (Architecture, Engineering and Construction) are now routinely using computing and ICT Tools in many Tasks", however, the penetration of this practice, the policy and strategy behind it, the efficiencies gained and the barriers to e-business implementation had not been examined with empirical data. This gap in knowledge was recognized by the International Council for Research and Innovation in Building and Construction (CIB) and they acted to set up an international working group to examine these aspects in 2011. This working group, named TG83, has completed surveys of construction e-business in a number of countries.

1.1. CIB working group TG83

TG83 was formed by the International Council for Research and Innovation in Building and Construction as an international group in 2011 to generate a series of events and publications to chart best practice in e-business. The international working group had an international remit to promote and conduct joint research into e-business, and to explore developments in the practice of web-based software for collaboration and e-business in construction. The initial research phase included the United Kingdom (UK) [8], Canada [9], Ghana [10] and Australia [11], this paper reports on Bulgaria and a report on Sri Lanka is due to follow. This working group has also generated a book "Advances in Construction ICT and E-Business" [12].

1.2. Examination of e-business issues

This paper examines the extent of electronic document exchange in Bulgaria for the first time. Laudon and Traver [13] list various e-commerce applications

of e-business. These are examined within Section 3.1 of the paper, having been specifically adapted for construction purposes.

Further examination of core business documentation that can be made electronic from construction takes place in Section 3.3, from a combination of accounting, finance, marketing and project management based on the findings of Issa *et al.* [14], human resource management and facilities management based on Ashworth and Perera [4], and distribution based on Papazoglou [15] and procurement having specifically been assisted in construction by the introduction of the NEC conditions of contract [16]. These issues in relation to e-business ranking had not been previously examined for Bulgaria.

Methods of dissemination and document sharing were then examined having been identified as the internet [2], extranets [17], and Sky Drives/Cloud computing [18]. The importance of e-business sharing methods and e-business enabling technologies such as internet based programmes, CAD, BIM and Cloud computing had not been previously examined for Bulgaria.

Further there had been little previous investigation into skills development, investment, internal policy documentation and how organisations sought to improve their e-business capacity. This paper seeks to fill these knowledge gaps.

1.3. The questionnaire survey

The content of the survey and the questions asked were similar for each country that conducted the survey. This allows easy comparison of the results across the countries involved. The questionnaire for Bulgaria was conducted using the Limesurvey^{TM} software. This allowed the electronic questionnaire to be disseminated in two languages, English and Bulgarian, with the respondents toggling between the languages to choose which language they wanted the questions to appear in. It is, therefore, unsurprising that all those who responded chose to view the Bulgarian translation of the questions. The questionnaire contained six main sections to investigate electronic business (e-business). The structured sections in the survey were: Background Information, e-Business in Respondent Organisations, IT Investment Advice and e-Skills Development, Drivers, Impact and Barriers of e-Business, Improvement of e-Business and Future of e-Business. The survey was disseminated to Bulgarian construction organisations, through the Bulgarian Construction Chamber, and organisations registered interest and completed the survey. This software has a PHP web-based user interface connected to a MySQL database which is used for gathering and analysing the questionnaire data.

The questionnaire contained scaled questions each having a scale of High, Medium, Low and none. Coding of this scale allowed adoption of the Relative Importance Index (RII) formula to define the importance of each element. The coding resulted in a "High" value being given 3, a "Medium" 2, "Low" 1 and "none" 0. The standard RII formula determined the respondent's grade for each of the ranking questions. RII is defined by the following formulae:

$$\text{Relative Importance Index } (RII) = \left(\sum W\right)/(A \times N),\ (0 \leq \text{index} \leq 1),$$

where W is the weighting given to each element by the respondents. This will be between 0 and 3, where 0 is the least significant impact and 3 is the most significant impact; A is the highest weight (3 in our case); and N is the total number of respondents.

2. RESEARCH METHOD

An e-mail was sent through the Bulgarian Construction Chamber database to all the construction organisations registered. This signposted the link to the survey and requested completion from as many of the 2000 registered organisations as possible. Ninety-one organisations signed up to complete the survey but only 55 submitted fully completed responses. The analysis was only carried out on the 55 fully completed responses, partially completed responses were ignored. Isaac and Michael [19] published tables indicating numbers required from a for a 10% error level from a total population. From their table, with 2000 organisations registered in the Bulgarian Construction Chamber a sample of 95 is required. Rubin and Babbie [20] suggest that a minimum of 50% of the 95 are required to fully respond to allow validity. With 55 completed questionnaires returned, this study surpasses the 48 required to meet the Rubin and Babbie [20] criteria, and can therefore be generalised as the viewpoint for construction organisations across Bulgaria.

2.1. Sample response composition

Table 1 indicates that the majority of respondents were from contracting organisations. Organisations were allowed to pick all the roles their organisation carried out. Therefore some organisations chose a number of roles in the statistics in Table 1. An example of this was a contractor with a sub-contractor role on other jobs and in another case one organisation was both a main contractor and a supplier. One organisation chose other and described themselves

TABLE 1. Sample composition
ТАБЛИЦА 1. Състав на пробата

Type of Organisation	Number	%
Consultant	1	1.56%
Main Contractor	47	73.44%
Supplier	2	3.12%
Manufacturer	2	3.12%
Sub-Contractor	10	15.64%
Fabricator	0	0.00%
Plant Hire	1	1.56%
Other	1	1.56%
Total	64	100%

TABLE 2. Work specialisation and areas of work
ТАБЛИЦА 2. Работна специализация и области на работа

Work Specialisation	Number	%
Building works contractor	6	8.69%
M&E Contractor	3	4.35%
Quantity Surveying	0	0.00%
Architect	0	0.00%
Engineer	6	8.69%
Trade Contractor	1	1.45%
Building Material Supplier	0	0.00%
Civil Engineering contractor	35	50.72%
Other Maintenance contractor	2	2.90%
Property Developer	9	13.05%
Facility Manager	3	4.35%
Other	4	5.80%
Total	69	100%
Areas of Work	Number	%
Building work	7	10.00%
Civil Engineering work	43	61.43%
Refurbishment	17	24.28%
Historic preservation	1	1.43%
Other	2	2.86%
Total	70	100%

as a Trading Company. It can be seen that 89.08% of the respondents were either contractors or sub-contractors.

The work specialisation and areas of work that respondents cover are shown in Table 2. This shows the majority of respondents are from a civil or building contractor speciality (59.41%). Four describe their speciality as "other", these were Landscaping, quality management, a water provider for irrigation and a constructor of communication infrastructure. Again it can be seen from Table 2 that the majority are involved in Civil Engineering work (61.43%). The two who chose other were involved with electrical construction and landscaping.

TABLE 3. Size of Organisations
ТАБЛИЦА 3. Размер на организациите

Work Specialisation	Number	%
(Sole Trader)	0	0.00%
2–9	10	18.18%
10–49	21	38.18%
50–249	20	36.36%
250 and over	4	7.28%
Total	55	100%

Only 12 out of 55 (21.82%) worked as IT specialists, as most were at senior management level within their organisations (48 No.:90.88%). Table 3 indicates that as expected, when the sample is mainly from contractors, 75.68% are in the Small Medium Sized Enterprise (SME) bracket.

3. FINDINGS ON E-BUSINESS IN BULGARIA

3.1. ELECTRONIC DOCUMENT EXCHANGE

Table 4 indicates that Administration Documents are the most likely to be exchanged electronically with Contract documents second. Contract Documentation being exchanged electronically in second place indicates that Bulgaria is leading the way in regards to electronic data exchange for contracts. It also shows that smaller contracts confirmed by e-mail that do not go through a tender process make up a large percentage of the contracts in Bulgaria. This is evidenced in that the Tender process is ranked in third position directly below the contract documentation. Plant and labour procurement and exchange of design documentation are poorly utilised in Bulgaria, suggesting that efficiencies could be gained by increased adoption of electronic processes in these

areas. Further the lack of Building Information Modelling (BIM), demonstrated in the findings of a further question described later, indicates a lack of collaboration electronically at design stage. The implementation of BIM would increase electronic collaboration and promote design stage efficiencies evidenced in it being ranked in first position in [5].

TABLE 4. Findings on Electronic Document Exchange
ТАБЛИЦА 4. Констатации по електронен обмен на документи

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Administration Documents	27	21	5	1	128	54	2.37	0.79	1
Contract Documents	27	15	8	1	119	51	2.333	0.78	2
Tender Documents	24	24	3	2	123	53	2.321	0.77	3
Valuations and Final Accounts	17	23	7	1	104	48	2.167	0.72	4
Tender Process	22	17	5	6	105	50	2.1	0.70	5
Purchase Orders/Invoices	18	24	8	3	110	53	2.075	0.69	6
Materials Procurement	19	17	12	3	103	51	2.02	0.67	7
Cost Planning/ Cost Control	16	18	12	3	96	49	1.959	0.65	8
Project Programming	16	18	6	6	90	46	1.957	0.65	9
Project Monitoring	14	16	14	3	88	47	1.872	0.62	10
Specifications	14	19	6	7	86	46	1.87	0.62	11
Sub Contracting	11	19	12	7	83	49	1.694	0.56	12
Estimating	9	15	12	6	69	42	1.643	0.55	13
Labour Procurement	11	16	15	7	80	49	1.633	0.54	14
Design	12	14	5	13	69	44	1.568	0.52	15
Plant Procurement	7	14	13	8	62	42	1.476	0.49	16

Further efficiencies could be gained within the Bulgarian workforce through collaboration tools such as a common data environment which comes in addition to the use of BIM. Products such as ASITE promote the exchange of electronic documentation at estimating and sub-contracting stages within a project. This section's findings, therefore, identify major areas where efficiencies can be achieved through electronic means.

3.2. Which core business documents are electronic

Table 5 indicates that core functions relating to financial functions are the electronic systems most used in Bulgaria. These complete the top three positions in the Table 5. Programming with project management is ranked fourth, down a place from the publication of the initial findings. The financial standing of an organisation is vital to its existence and therefore the use of electronic means for accounting, finance and procurement have been ranked as being top in importance on the list for core activities that are ICT enabled in Bulgaria. Project Management is now becoming more electronic with Microsoft Project amongst a number of bespoke programmes that allow detailed analysis of project performance on site. Project management software such as this produces "S-Curves" and other financial measure to track organisational income and expenditure as a result of the project. Additionally, other financial systems have been developing specifically for construction to interrogate financial aspects related to rental of plant, salaries, and material costs.

TABLE 5. Findings on degree to which core business documents are electronic
ТАБЛИЦА 5. Изводи за степента, до която основните бизнес документи са електронни

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Accounting	35	10	8	0	133	53	2.509	0.836	1
Finance	30	15	5	0	125	50	2.500	0.833	2
Purchasing (procurement)	20	19	10	2	108	51	2.118	0.710	3
Project Management	16	22	10	1	102	49	2.082	0.694	4
Human resource management	24	9	13	4	103	50	2.060	0.687	5
Distribution	10	16	13	3	75	42	1.786	0.595	5
Marketing	12	17	10	8	80	47	1.702	0.570	7
Facilities management	9	19	17	4	82	49	1.673	0.558	8

Table 5 also indicates that Facilities Management is one of the least electronically enabled core business elements. This supports findings by Eadie *et al.* [5] indicating that Facilities Management is the least used element of BIM in the UK and yet the second most significant for cost savings. To transfer this to the Bulgarian situation indicates an element of e-business that Bulgarian

organisations could treat as low hanging fruit to maximise cost savings and become more efficient over the life-cycle of the project.

3.3. Communication networks

Table 6 shows that the Intranet is the largest way of transferring documents on a network. Particularly of interest, however, is that Sky Drives / Cloud Networks are little used in Bulgaria. This contrasts sharply with the findings for the UK [8]. It shows that trust in cloud based systems is not as advanced in Bulgaria. It also indicated that 8.33% of organisations do not collaborate electronically through either the internet or an extranet.

TABLE 6. Communications network use
ТАБЛИЦА 6. Използване на комуникационната мрежа

Communications network	No. of responses	Percentage of responses
Intranet	35	58.33%
Extranet	4	6.67%
Both	10	16.67%
Neither	5	8.33%
Sky drives/Cloud networks	6	10.00%
Total	60	100%

Extranets incorporating a Common Data Environment (CDE) are becoming more common in the UK. Electronic collaboration is identified as one of the greatest drivers for BIM [21]. Software companies are therefore promoting collaboration through cloud based systems in the UK with common data environments including Industry Foundation Class (IFC) viewers and Autodesk A360 being used to exchange design information electronically. As efficiencies are reported and international collaboration takes place, the use of CDE's in Bulgaria may increase substantially over the next few years.

3.4. Electronic communication internally & externally

Table 7 indicates external communication is more likely to be in electronic form than internal communication. Internal communication appears to be more verbal in Face-to-Face format in Bulgaria as there is substantially less of it in electronic form. The top three rankings have not changed since the initial 37 responses were reported. However the positions of Rank 4 and 5 and Rank 6 and 7 have swapped. This was because only a single response and 2 responses separated the rankings in the initial assessment. With larger firms

adding to the responses, e-procurement has overtaken lessons learned documentation. This could be because larger firms are more likely to be tendering electronically for contracts above the European Financial Threshold. Contracts below this threshold are unlikely to be electronic in Bulgaria. Project collaboration and supply chain management also swapped places in the final assessment. Again it is likely the extra firms with over 250 employees would be involved in international work and therefore more likely to use electronic collaboration.

TABLE 7. Internal and External Communication
ТАБЛИЦА 7. Вътрешна и външна комуникация

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
External Communications	30	19	4	0	132	53	2.491	0.83	1
Internal Communications	18	17	14	2	102	51	2	0.667	2
Customer relationship management	13	22	10	4	93	49	1.898	0.633	3
Electronic Procurement (purchase material and equipment)	14	22	8	7	94	51	1.843	0.614	4
Lessons Learned Documentation	11	21	8	6	83	46	1.804	0.601	5
Project collaboration and management	9	18	14	6	77	47	1.638	0.546	6
Supply Chain Management	9	21	13	6	82	49	1.673	0.558	7
Product Service Promotion	12	12	11	11	71	46	1.543	0.514	8
Bidding and tendering online (whole project delivery)	3	12	5	26	38	46	0.826	0.275	9

3.5. Preferred e-business enabling technologies

Table 8 indicates that on-line software, delivered through the internet, is the predominant e-business enabling technology in Bulgaria. Its rank in first place and higher than AutoCad based systems was not unexpected as it has a much wider range of applications. These cover calculation packages, finance and other issues. However, as BIM is ranked in final place in Bulgaria, it shows that this software could be adopted readily to make a difference. Eadie

TABLE 8. E-Business Enabling Technologies
ТАБЛИЦА 8. Е-бизнес активиращи технологии

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Internet	19	13	4	4	87	40	2.175	0.725	1
CAD	13	10	1	10	60	34	1.765	0.588	2
Cloud Computing	3	8	9	11	34	31	1.097	0.366	3
BIM	3	8	3	13	28	27	1.037	0.346	4

et al. [21] provides details of substantial benefits that could be accrued from adopting BIM. These could be replicated in Bulgaria.

While BIM and Cloud Computing have changed positions (from 3 to 4 and vice versa) from the reporting of the initial results of this survey [22], it can be seen from the RII value in Table 8 is still below 0.5 indicating it is little used. Cloud based systems for file sharing such as Dropbox, Box, and others have become increasingly popular in the UK. Matthews *et al.* [23] indicate that this move has meant that many paper-based processes have been re-engineered to encompass the use of cloud-based BIM during construction. Comparatively, while BIM and Cloud computing, still remain in the bottom two positions in the UK survey [8] they have a much deeper embedment within the construction industry, evidenced in both having RII values above the 0.5 threshold. Therefore in the UK, BIM and Cloud Computing have only slightly less embedment than CAD in the Bulgarian Construction industry. As a result, in relative terms, substantial efficiencies can be gained from deeper adoption of these technologies in Bulgaria with potentially substantial efficiency gains.

3.6. E-skills development

Table 9 indicates that in relation to e-skills development in Bulgaria, staff is expected to self-learn new technologies. The RII value of 0.255, in Table 9, indicates that it would be rare in Bulgaria for a company hire an IT professional to train their staff. Table 9 proves the significance of "How To" guides, and literature such as books in relation to learning new software as these will be the first place that staff turn to in order to seek assistance. Table 9 demonstrates this importance with the RII value given to self-learning being 33%

TABLE 9. Skills development
ТАБЛИЦА 9. Развитие на уменията

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Staff learn new computerised skills through self-learning	11	24	17	3	98	55	1.782	0.594	1
Staff attend training courses outside your organisation	5	14	24	13	65	55	1.182	0.394	2
Hire IT practitioners to train your staff	0	13	16	26	42	55	0.764	0.255	3

higher than the next method of skills development which is that staff attend courses outside the organisation.

The practical implications of these findings are that software companies and publishing offices should devote resources into providing the best "How to" guides possible. Training organisations need to promote their training provision to make an impact. The costs associated with training should also be factored into the results.

3.7. Reasons for e-business adoption

Table 10 indicates the reasons for e-business adoption and was not originally reported in [22]. The reasons behind e-business adoption were ranked by the

TABLE 10. Skills development
ТАБЛИЦА 10. Причини за приемането на електронния бизнес

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Belief in the competitive advantage of e-business	19	19	8	9	103	55	1.873	0.624	1
Customers expect it from you	11	21	13	10	88	55	1.6	0.533	2
Competitors also engage in e-business	8	17	19	11	77	55	1.4	0.467	3
Supply chain expect it	8	17	16	14	74	55	1.345	0.448	4

respondents in order of importance in Table 10. It can be seen from Table 10 that organisations acknowledged that competitive advantage is the most convincing reason to engage in e-business.

3.8. Benefits of e-business

Table 11 ranks the perspectives of respondent organisations relating to the benefits or positive impacts of e-business adoption. Table 11 provides these rankings and indicates that within Bulgaria the accounting and administration

TABLE 11. Reasons for e-business adoption
ТАБЛИЦА 11. Въздействие/ползи от приемането на електронния бизнес

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Accounting and administration	25	22	4	4	123	55	2.236	0.745	1
Management and control	21	20	9	5	112	55	2.036	0.679	2
Time and cost savings	19	22	10	4	111	55	2.018	0.672	3
Productivity	21	18	11	5	110	55	2.00	0.667	4
Internal organisation relationship	20	19	10	6	108	55	1.964	0.654	5
Expansion of partnership	17	23	11	4	108	55	1.964	0.654	6
Efficiency of business processes	17	22	13	3	108	55	1.964	0.654	7
Visibility to supply chain	18	20	13	4	107	55	1.945	0.648	8
Improving collaboration	14	26	12	3	106	55	1.927	0.642	9
Competitive advantage	16	21	12	6	102	55	1.855	0.618	10
Quality of customer service	17	20	10	8	101	55	1.836	0.612	11
Innovation	16	22	9	8	101	55	1.836	0.612	12
Staff training	12	26	13	4	101	55	1.836	0.612	13
Organisational innovation	15	22	11	7	100	55	1.818	0.606	14
Procurement cost of supplied goods	11	24	13	7	94	55	1.709	0.57	14
Market reach	12	22	11	10	91	55	1.655	0.552	16
Research and development	12	18	13	12	85	55	1.545	0.515	16
Growth of revenue	12	16	15	12	83	55	1.509	0.503	16
Quality of products	9	19	16	11	81	55	1.473	0.491	19

aspects of e-business produce the highest benefits. Table 11 shows that management and control with the visibility that e-business provides was ranked in second position, followed by the time and cost savings. The second and third benefits match the second and third benefits in the UK [8]. Productivity ranked in fourth position with Internal Organisation relationship in fifth position. While these rankings show the benefits they do not identify the embedded maturity of these elements within Bulgarian Construction organisations. It is suggested that a model such as one of those identified in [16] be adopted for that purpose.

TABLE 12. Impacts/Benefits of e-business adoption
ТАБЛИЦА 12. Въздействие/ползи от приемането на електронния бизнес

Use	High	Medium	Low	None	Ranked Sum	No. Responses	Rank Value	RII	Rank
Availability of professional software	6	27	15	7	87	55	1.582	0.527	1
Cost of investment	11	14	23	7	84	55	1.527	0.509	2
Modification of legacy systems	8	19	17	11	79	55	1.436	0.479	3
Lack of technical skills	6	20	21	8	79	55	1.436	0.479	4
Security of data transaction and submission	4	26	14	11	78	55	1.418	0.472	5
Confidence in using new technology	4	23	19	9	77	55	1.4	0.467	6
Interface with other systems	2	26	16	11	74	55	1.345	0.448	7
Changeable IT technical needs of an organisation	6	19	17	13	73	55	1.327	0.442	8
Lack of research in IT in construction (R&D)	8	12	23	12	71	55	1.291	0.43	9
Resistance to change	4	19	21	11	71	55	1.291	0.43	10
Socio-economic problems	3	20	21	11	70	55	1.273	0.424	11
Legal barriers	3	21	18	13	69	55	1.254	0.418	12
Cultural influence	4	16	22	13	66	55	1.2	0.4	13
Basic competency in IT	3	14	28	10	65	55	1.182	0.394	14
Lack of power supply (mainly developing countries)	1	8	17	29	36	55	0.655	0.218	15

3.9. Barriers to implementing e-business solutions

Table 12 indicates a ranking of the barriers to e-business solution adoption. As full adoption has not occurred within Bulgaria it is evident that there must be a number of barriers that seek to slow full employment of these solutions. Respondent organisations were asked to rank the importance of these barriers and the availability of professional software was ranked as the most important barrier. The cost of Software solutions were ranked in second position. When these are considered together, if freeware such as some of the freeware open BIM solutions were available in the Bulgarian language it would substantially increase the uptake of software across the country. Legacy systems which still exist from the USSR and current day Russia are used within the country. To adapt these for interoperability with Western based systems is a challenge and has resulted in "Modification of Legacy systems" being ranked in third place. Further research needs to be carried out into the interoperability issues. Again the findings of section 3.7 have relevance here as "Lack of Technical Skills" is ranked in fourth position. The opportunities for education and training organisations are evident, however, the training must be costed at the correct level or it will add to the barrier already discussed in second position.

3.10. Investment in e-business solutions

Table 13 indicates the respondent's average annual IT budgets, including investment in hardware, software, services and personnel over the last five years. It can be seen from Table 13 that over three-quarters (78.8%) only spent 1–4% of their annual budget on IT on average over the last 5 years. Almost ninety-six (96%) percent of respondents had an expenditure of less than 9% of their annual budget on IT over the last five years. This indicates

TABLE 13. Degree of IT expenditure in the last 5 years
ТАБЛИЦА 13. Степен на разходите за ИТ през последните 5 години

Average annual share of your IT budget, including hardware, software, services and personnel, as percentage of your total company costs in last 5 years		
	Count	Percentage
1–4%	37	78.8%
5–9%	8	17.0%
10–14%	1	2.1%
20%+	1	2.1%
Total	47	100%

that there is underinvestment in keeping up to date with the latest software or that existing software allows organisations to ensure that the correct level of efficiency is maintained. In the UK with BIM having been made mandatory for government projects the expenditure as a percentage of turnover went up [8]. It would be expected that this might also occur in Bulgaria when the mandatory implementation of e-procurement and other European initiatives take effect.

Not only is investment in software systems much less by percentage of turnover in Bulgaria compared to the UK, it can be seen from Table 14 that the immanency of future investment is less. The majority of Bulgarian organisations operate on a one or two year cycle. What is worrying however, is that 18.2% of organisations have no plans to make future investment in IT systems. This means that the promoted efficiencies cannot be realised for these organisations.

TABLE 14. Planned future investment in e-business
ТАБЛИЦА 14. Планирани бъдещи инвестиции в електронния бизнес

Future Investment	Count	Percentage
Plan to make an investment in 0∼ 6 months	7	12.70%
Plan to make an investment in 6 months ∼ 1 year	18	32.70%
Plan to make an investment in 1 ∼ 1.5 years	4	7.30%
Plan to make an investment in 1.5 ∼ 2 years	16	29.10%
No plans to make an investment	10	18.20%
Other	0	0.00%
Total	55	100%

Government initiatives have driven IT investments in UK organisations. This paper suggests that target setting by the Bulgarian government in relation to European initiatives and electronically efficient delivery mechanisms would drive the construction industry towards adopting more efficient work practices.

3.11. IT investment advice and internal policy

Following the questions on investment expenditure, respondents were asked to indicate where they sourced their IT advice. Table 15 indicates that the majority obtain advice on IT investment from professional IT providers (50.9%). While this reliance on professionals is admirable it produces two difficulties. The first implication is that the salesperson has a conflict of interest. The salesperson will always promote the software that they are selling, whilst they

TABLE 15. IT Investment Advice for e-business solutions
ТАБЛИЦА 15. ИТ инвестиционни съвети за решения за електронния бизнес

Advice	Count	Percentage
Obtain advice on IT investment from professional IT providers	28	50.9%
Obtain advice from own IT department or IT practitioners	20	36.4%
Learn through university or other research parties	5	9.1%
Implement IT investment through government/third party recommendations	2	3.6%
Total	55	100%

may be aware of other software better suited to the client's needs. The second issue is that the salespersons who are promoting the IT systems need to be aware of all the developments in the field. Some are only trained in the systems that they are selling and are therefore unaware of other competing systems that the organisations that they are visiting may be better suited investing in. The research link between Universities and industry seems underdeveloped in Bulgaria with only 5 respondents using the research learning of the universities prior to investment. This indicates an opportunity for academician and industry alike as the academician can play the part of the unbiased broker in promoting the best software for the organisation.

Respondent organisations were then asked about internal e-business implementation policy within their organisation and when they were to implement such a strategy. Some organisations had more than one policy, one had a short, medium and long-term policy. Table 16 indicates that 31.6% have a short term plan (up to two years) in place. However, a greater number in Bulgaria than the UK (35.1% against 30%, respectively) do not know yet whether they will be implementing an e-business strategy. In order to benefit

TABLE 16. Planned Launch date for an e-business strategy
ТАБЛИЦА 16. Планирана дата за стартиране на стратегия за електронния бизнес

e-business policy	Count	Percentage
Short-term (up to 2 years)	18	31.6%
Medium-term (3∼5 years)	13	22.8%
Long-term (over 5 years)	6	10.5%
Don't know yet	20	35.1%
Total	57	100%

from funding and promotional opportunities organisations need to be aware of what they need and should be planning at least in the medium and long term to gain maximum efficiencies.

3.12. Improvement of e-business – internal resources

The following four sections of the questionnaire examined how the organisations intended to improve e-business within their organisation from different standpoints. The first standpoint related to internal resources. From the list in Table 17, they could select any that applied. The responses were added together and a percentage of the responses that related to each element examined. Table 17 indicated that the best way of improving the e-business internally was to increase the training of working staff. This further emphasises the findings in Section 3.7 and suggests that people are at the centre of an efficient organisation. In second place was expenditure in IT infrastructure indicating that the correct tools in terms of software and hardware must be provided. Increasing the amount of IT staff or getting professional help during the implementation process was placed third again emphasising the need for universities and training providers to produce skilled personnel and graduates who are employable in order bring efficiencies to the employing organisations.

TABLE 17. Organisation's internal resources used in improving e-business
ТАБЛИЦА 17. Вътрешните ресурси на организацията, използвани за подобряване на електронния бизнес

Internal Resources	Count	Percentage
More IT Investment Funds	11	15.10%
More expenditure in IT infrastructure	14	19.20%
Increase IT working staff or hire professionals to help	13	17.80%
More senior management involvement	5	6.80%
Better training for working staff	30	41.10%
Other	0	0.00%
Total	73	100%

3.13. Improvement of e-business – business process reengineering

The identification of improvements that e-business brings in regard to business processes were next identified. Again the responses were added together and a percentage of the responses that related to each element examined. Table 18 indicated that the best business process that would be most useful in

TABLE 18. Organisation's business processes used in improving e-business
ТАБЛИЦА 18. Бизнес процесите на организацията, използвани за подобряване на електронния бизнес

Business Processes	Count	Percentage
Automation of business processes	21	28.40%
Integration of different business processes	25	33.80%
Reengineering business processes	9	12.20%
Connect e-business value to business performance	19	25.60%
Other	0	0.00%
Total	74	100%

improving e-business was the integration of the disparate e-business processes. The issues relating to the interoperability of e-business and e-procurement have been highlighted by Eadie and McClean [24]. These issues produced a worldwide desire for fully interoperable systems. However, solutions between financial systems and design still leave a lot to be desired. The second highest improvement will arise from the automation of different business processes. Key aspects for future research in Bulgaria are therefore interoperability and automation.

3.14. Improvement of e-business – organisational culture

While organisational culture in Bulgaria was not seen as a major issue (Ranked 13 out of 15 in Table 12), organisations were still asked how their organisation desired to improve e-business in this regard. The responses are provided in Table 14 which indicated that the two most important cultural

TABLE 19. Organisation's cultural elements used in improving e-business
ТАБЛИЦА 19. Културните елементи на организацията, използвани за подобряване на електронния бизнес

Organisational Culture	Count	Percentage
Recognise the benefits and importance of using e-business	21	28.40%
Encourage staff to use e-business tools	24	32.40%
Commit to address issues/inhibitions when using e-business	11	14.90%
Change organisation culture to suit for e-business adoption and use	18	24.30%
Other	0	0.00%
Total	74	100%

elements impacting on the improvement of e-business were to recognise the benefits and importance of using e-business and to encourage staff to use e-business tools.

3.15. Improvement of e-business – business goals

Lastly, respondent organisations were asked to select one of the statements provided in Table 20 that best described their organisation's desire to improve e-business through business goals. With reference to this, three statements covering different approaches to policy implementation of e-business were provided. It can be seen from Table 20 that e-Business policy integrated with the overall business goal is the predominant approach among Bulgarian companies. Respondents in Bulgaria followed those in other countries in this belief with respect to making e-business an integral part of the overall business goal in the broadest sense. This shows that construction organisations are as forward thinking as most other industries in this regard.

TABLE 20. Organisation's business goals used in improving e-business
ТАБЛИЦА 20. Бизнес целите на организацията, използвани за подобряване на електронния бизнес

Business Goals	Count	Percentage
Sell-side e-business policy, no need to integrate with the overall business goal	6	10.9%
e-Business policy integrated with the overall business goal	18	32.7%
e-Business policy incorporated as part of the overall business goal	31	56.4%
Other	0	0.00%
Total	55	100%

4. CONCLUSIONS

This paper provides the findings in relation to Bulgaria of a survey for the CIB TG83 e-business in construction research forum. The paper used empirical data gathered through a web-based survey to identify that in Bulgaria administration documentation is the most likely to be exchanged electronically (Table 4). The amount of administration documents exchanged electronically in high frequency (49%) is slightly more electronic than the UK (42%) [8] and Canada (30%) [9], but similar to Australia (49%) [11]. This confirms the high rise in email for communication over the last number of years. Currently in

Bulgaria there is a low level of exchange of electronic documentation during the design, estimating and sub-contracting stages of a project and this is an area that could be targeted to make the construction industry more efficient. High use of BIM is poor in Bulgaria (11%) compared to the UK (33%) [8], but better than Canada [9] (7%). With Eadie *et al.* [5] identifying this as a major source of efficiency it could be chosen as an immediate means of increasing efficiency and reducing issues through clash detection in the Bulgarian construction sector. The figures do support the importance of the UK Government Construction Strategy in pushing up implementation of BIM.

In Bulgaria, accounting and finance are the two areas where electronic systems are most used in construction (Table 5). This would indicate that financial systems developed specifically for construction are being well used. Systems such as these cover items such as the rental of plant, salaries, and material costs. Electronic banking systems are also improving and could be adding to the rank in Bulgaria. Furthermore, Table 5 indicates that facilities management (FM), estimating and sub-contracting are some of the least electronically enabled core business elements. This supports the findings of Eadie *et al.* [5] which shows Facilities Management is also the least used element of BIM, but yet the second most significant in relation to cost savings. Targeting this aspect of e-business is an area in which Bulgarian organisations could make cost savings. Little use is made of cloud based systems in Bulgaria and the efficiencies they bring are a further benefit that Bulgarian Construction organisations could utilise. Cloud computing is much more widely utilised in the other countries that took the survey, with the exception of Ghana.

Table 9 indicates that staff self-learn new technologies mirroring the result in the other countries. However, the gap between it and training courses is much wider in Bulgaria. This has two important implications: 1 that universities and training providers have a market to provide advice and training on the types of software best suited to Bulgarian organisations and 2 that software developers should seek to make manuals and on-line help as self-explanatory as possible. Section 3.10 also identifies the lack of technical skills as a barrier to e-business adoption in Bulgaria, further emphasising the opportunity for universities and training providers to capitalise on this market providing that they do not overcharge, as this will add to the cost of investment barrier. It can be seen that investment in IT systems is low in Bulgaria with 96% of organisations spending less than 9% of their total company costs on IT systems over the last 5 years. This compares to 88% UK, 86% Canada, and 49% in Australia. It can be seen that Australia has invested heavily in IT to make it more efficient and the other countries are investing less. This lack of invest-

ment needs to be addressed. Not only has Bulgaria the least investment in IT, it has the longest time before investment is due to be made in electronic systems and the most organisations without an IT policy.

E-business is seen to benefit similar functions to the UK. However, it benefits accounting and administration the most. In a very bureaucratic country such as Bulgaria these benefits are not to be underestimated. The availability of professional software was ranked as the most important barrier, with the cost of Software solutions ranked in second position. When considered together, freeware alternatives such as some of the freeware open BIM solutions need to have Bulgarian language translations. This would substantially increase the uptake of software across the country. Legacy systems still existing from the USSR and current day Russia are still being used within the country. To adapt these for interoperability with Western based systems is a challenge and has resulted in "Modification of Legacy systems" being ranked in third place in the list of barriers. Further research needs to be carried out into these interoperability issues.

The investigation into how to improve e-business within organisations was conducted in relation to 3 aspects: internal resources, which identified training of staff as the major way to improve e-business, business process reengineering, which identified integration of systems as a way of improving e-business within the organisation, organisational culture, which again considered the encouragement of staff to use e-business tools as a way to increase its use.

Finally business goals and the integration with e-business were examined. It was found that Bulgarian Construction Companies were progressive suggesting that e-business should be completely integrated with the overall goal of the business making it an integral part of any strategy.

Further work is needed to examine the most cost effective ways of implementing e-business in Bulgaria.

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Е-БИЗНЕСА В БЪЛГАРИЯ

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Резюме. Статията представя изводите от изследване на е-бизнеса в България. Изследването е направено за Международния Съвет за изследвания и иновации в сградите и конструкциите (СИБ). СИБ работната група 83 (TG83) е сформирана през 2011 г. за проучване и подпомагане на разпространението на е-бизнеса в строителството. Проучването е проведено в различни страни – Обединеното кралство, Канада, Австралия и Шри Ланка. Работата на Групата е продължена за да се включи и България. Във всяка от споменатите стра-

ни е използвано on-line проучване. Проучването в Камарата на строителите в България включва 55 пълни отговора. Анализът показва, че в България използването на е-бизнеса е по-малко в сравнение с Обединеното кралство. Това означава, че чрез възприемането на е-бизнеса българските строителни компании имат по-голям потенциал за постигане на ефективност в резултат на неговото приложение. Статията показва пътя по който българските компании могат да постигнат по-ефективни резултати и да реализират внедряването на е-бизнеса. Използването допълнително на интелигентно управление, оценка, специализиран софтуер и електронно базирани системи има потенциала да подобри ефективността на българските строителни организации и да спести разходи и време при запазване на качеството.

Keywords: СИБ, Електронен Бизнес, ТГ83, България.

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